Washington Excise Tax Microsimulation Model
2002

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The Washington Excise Tax Microsimulation Model is a database and set of SAS programs that can be used to assess how taxes in the current excise tax system and alternatives to that system are distributed across different classes of Washington households. The model can illustrate the tax distribution on households by income group, household size, tenure, and total outlays.

Data

The model is created from two data sets - the Washington State Population Survey and the Consumer Expenditure Survey.

The Washington State Population Survey (SPS) was designed by the Washington Office of Financial Management in a manner similar to the national Current Population Survey. The most recent SPS was conducted in the spring of 2000. The survey asked questions about employment, income, household composition (number of residents, ages, etc), and housing characteristics. The survey collected information on 6,726 Washington households.[i]

The Consumer Expenditure Survey (CEX) is a continuing survey conducted by the Bureau of Labor Statistics of the United States Department of Labor.[ii] The survey is used by the Bureau to update the structure of the consumer price index and to provide information about spending patterns of different types of families. The CEX is actually two different surveys – a diary survey and an interview survey.

The primary purpose of the diary survey is to collect expenditure information on small frequently purchased items, such as, food and beverages, housekeeping supplies, nonprescription drugs, and

personal care products. Participating households record expenditures over two week period. The diary survey covers all expenditures during each week of the survey. An interviewer from the Bureau collects demographic information from the household when retrieving the diary.

Each participant in the interview survey is interviewed every three months. Participants are asked about expenditures over the previous three months. The survey gathers data on large expenditures, such as automobiles, property, and appliances, as well as regular expenses, like rent, utility costs, and insurance premiums.

The interview survey collects very detailed information on about 60 to 70 percent of household expenditures. Additional, more aggregated, information about food and other expenditures is also obtained on 20 to 25 percent of total expenditures. So, the interview survey covers between 80 and 95 percent of total expenditures.

The SPS is used in the model to represent the distribution of Washington households across income and other classes. The CEX is used to assign spending patterns to the Washington households in the SPS data set.

Method: Combining the CEX with the SPS

In the Washington Excise Tax Microsimulation model, the SPS and CEX data sets are combined at the household/consumer unit level using a statistical matching procedure. Statistical matching is a procedure designed to provide supplemental data when a single survey does not contain all the information necessary for a desired analysis. Using statistical matching a second survey containing the desired additional information is matched to the first survey based on data that is common with the first survey. The common data is used to find and match household/consumer units that are sufficiently similar (See figure 1). [iii]

SPS households are matched with CEX consumer units based on similarities in income, tenure, housing building type, presence of person over 64 in household or consumer unit, presence of person under 18, and size. These characteristics were chosen for three reasons. First, they are common to both data sets. Second, these characteristics are likely to be used as categories when displaying the results of the analysis. Third, these characteristics are related to consumption (See appendix 1).

Figure 1
Illustration of data sets for statistical matching

	Variables in Survey A	Variables in Survey A and B	Variables in Survey B
Observations in Survey A			Missing
Observations in Survey B	Missing		

Households in SPS and the CEX

The Washington State Population Survey (SPS) contains records on households and individuals within the households. A household includes all the people that live and sleep at the residence most of the time. Each household record contains information on the number of people in the household, the household's income, the type of residence, whether the household owns or rents the residence, number of persons below age 18, whether a person in the household received social security payments and many other items.

The basic unit of analysis for the CEX is the consumer unit. A consumer unit is a family, two or more unrelated persons living together who pool their income for making expenditures, or is single person that is financially independent. For purposes of this modeling exercise households in the SPS are considered to be equivalent to consumer units in the CEX.

Household Income

Respondents to the SPS were asked to provide an exact household income. They were also asked to place their household income into one of 9 income ranges. Not all respondents provided an answer to these questions. The Office of Financial Management created a variable for total household income from the responses to these questions. The value for this variable was derived in one of three ways: it was the same as the exact income response (about 47 percent of households); it was imputed from the income range response (about 42 percent of households); or it was imputed by regression (about 11 percent of households).

The SPS also collected information on social security income, interest, dividend, and rental income, wage and other income. Negative values were not allowed for these variables.

Participants in the CEX provided detailed information on a number of income types including, wages and salaries, business income, interest, dividends, rents, pensions, unemployment and workers compensation payments, child support, public assistance, value of food stamps, and other income. Before-tax income is the sum of these items. Participants were allowed report values for negative business income and rental income.

For purposes of the microsimulation model matching procedure, before-tax income variable in the CEX data set was adjusted to remove negative values for business and rental income and to remove the value of food stamps. This was done to make the two income definitions more alike. The adjustment also corrects the problem of classifying households with high consumption patterns into low reported income categories.

Matching SPS data to CEX data

The CEX data is available at the consumer unit level in quarterly data sets – one data set for the dairy survey and one for the interview survey. A complete set of annual data is thus contained in eight data sets. The statistical matching procedure matched each household in SPS to a CEX consumer unit in each of the four diary survey data sets and the four interview data sets that make up one year of data. The matching procedure was done seven times to produce seven independent sets of matches between SPS and CEX data. See Rubin for a discussion of multiple imputation.[iv]

The statistical matching procedure selects a household from the SPS. Then potential matching candidates are selected from the CEX data based on common values of: household income, household tenure, housing building type, presence of person over 64 in household, presence of person under 18 in household, and household size.

The selection of potential candidates was done in three rounds. In the first round an exact match was required for housing tenure, building type, household size, the presence of a person under 18 in household, and the presence of a person over 64. Household income was required to be within $7,500 if SPS income was below $100,000, within $12,500 for income between $100,000 and 130,000, and within $20,000 for income over $130,000. For all households not matched in the first round, a second round of attempted matching was conducted. The second round was based on the first round parameters, but the family size was allowed to vary by one person and the income match requirement was loosened as follows: within $15,000 for SPS income below $100,000, within $25,000 for income between $100,000 and 130,000, and within $35,000 for income over $130,000. In the third round, the building type requirement was dropped for any remaining unmatched households and the family size was allowed to vary by 2 persons.

If more than one candidate satisfied the criteria for matching, a candidate was selected randomly from the group.[v]

Approximately 90 percent of the SPS households are matched in the first round with consumer units in the CEX interview survey, about 8 percent are matched in the second and about 2 percent in the third round. For matches with the CEX diary survey, about 95 percent are matched in the first round, 4 percent in the second round, and 1 percent in the third round. See Appendix 3 for details of the number of successful matches by survey and imputation round.

Outcome of Matches

To judge the performance of the matching process, tables were prepared comparing consumption in the seven matched SPS data to consumption in the original CEX data. Also, attributed consumption in the seven matched SPS data sets were compared across the seven matched SPS datasets. These tables were done for consumption reported in the CEX interview survey.

Table 1 compares the average consumption by income category[vi] for the CEX data and the average of the seven SPS matched data sets. Appendix 4 contains charts comparing average consumption for the CEX data and the SPS matched data for selected detail expenditure categories broken out by income group. These tables and charts show a close correspondence between consumption reported in the original data and consumption in the matched SPS data sets.

Appendix 5 shows the average consumption for the seven SPS matched data sets for selected expenditure categories and also shows the range of results for the seven SPS matched data sets. The charts show very similar consumptions levels for most expenditure categories in each of the seven data sets. The range is wider for vehicle purchases than for other expenditure categories. This is expected because not all households purchase a vehicle each year.

Table 1

Average Consumption by Income Category

Average for CEX data compared to Average for the 7 Imputation Groups

	Total Expenditures	
	CEX	SPS Matched
	Average	Average
1999 HOUSEHOLD TOTAL INCOME		
$0 to $20,000	18,416	19,120
$20,000 to $30,000	26,955	25,410
$30,000 to $40,000	32,304	31,245
$40,000 to $50,000	38,451	37,874
$50,000 to $60,000	44,077	44,054
$60,000 to $70,000	49,023	49,470
$70,000 to $80,000	56,770	54,284
$80,000 to $100,000	60,581	62,017
$100,000 to $130,000	74,764	72,966
Over $130,000	105,952	99,786

Calibrating the Model

The model estimates the distribution of the sales and use tax and a number of the special excise taxes across households. The taxes are calculated by multiplying expenditures on items subject to the taxes by the tax rates. This section describes the expenditure items subject to each of the taxes, the adjustment to consumption expenditures to reflect under reporting in the CEX, and a comparison of aggregate tax estimates to independent estimates of the amount of these taxes paid by households.

Identifying the tax bases

The Consumer Expenditure Survey collects data on over 900 separate CEX expenditure and income categories. Appendix 6 is a table showing the categories in the survey subject to Washington sales and use tax. Expenditure categories subject to retail sales tax are identified in the column labeled "Current". Items that are fully taxable have a value of "1". For items that are partially taxable, e.g. home telephone services – where the basic residential service is exempt but other telephone services are not, the value is a fraction.[vii]

Expenditure items subject to other excise taxes are coded in the column labeled "Other". The codes are used to calculate the impact of these other excise taxes. The codes are as follows:

Table 2

Tax	Code
Beer (volume tax sold in original container)	1
Wine (volume tax on wine sold in original container)	2
Liquor (volume tax on liquor sold in original container)	3
Beer (volume tax sold by the drink)	4
Wine (volume tax on wine sold by drink)	5
Liquor (special sales tax on liquor sold by drink)	6
Insurance Premiums Tax (gross receipts)	7
Cigarette Tax (volume tax)	8
Other Tobacco Products Tax (wholesale value tax)	9
Public Utility Tax on Electricity	11
Public Utility Tax on Natural Gas	12
Public Utility Tax on Water/Sewer	13
Public Utility Tax on Garbage Collection	14
Gas Tax (volume tax)	15
Public Utility Tax on intercity transportation	17
Public Utility Tax on intracity transportation	18

Adjusting the data

To account for discrepancies between reported consumption levels in some categories and actual levels implied by tax collections, the amount of consumption reported in the CEX was adjusted. These discrepancies exist, for example, in the reported consumption for items such as alcoholic beverages and tobacco products. In addition, other expenditure categories are also underreported.[viii] Based on BLS publication that compares reported survey expenditures with independent estimates , the amount of spending was adjusted. In addition, some further adjustments were made so that aggregate tax revenue from households match estimates of revenue for the specific revenue sources such as alcohol taxes, tobacco taxes, and the gasoline tax.

Comparing aggregate tax estimates with model results

The Washington Department of Revenue estimates that 60 percent of the retail sales and use tax is paid directly by households. It would therefore be expected that for calendar year 1999 sales

taxable consumption within the excise tax microsimulation model would yield a state sales and use tax of $3.2 billion. Table 3 shows the estimated revenue collection from households for the state sales and use taxes and other excise taxes compared to the amount of tax estimated by the excise tax microsimulation model for the average of the seven imputation groups. The results for each imputation group are found in Appendix 7.

Table 3

Tax	Estimated Household Tax Collections (1999)	Model Estimate (Average of 7 imputation groups)
State Sales and Use Tax	$3.319 billion	$3.395 billion
Beer Tax (sold in original contained and by drink)	$29.6 million	$29.7 million
Wine Tax (sold in original container and by drink)	$12.9 million	$12.9 million
Liquor Volume Tax (sold in original container)	$46.0 Million	$43.0 million
Liquor Sales Tax (sold in original container)	$40.5 million	$40.0 million
Liquor Volume Tax (sold by the drink)	$16.9 million	$16.4 million
Liquor Sales Tax (sold by the drink)	$9.3 million	$9.3 million
Cigarette Tax	$328 million	$330 million
Other Tobacco Products	$32.9 million	$32.9 million
Public Utility Tax on Electricity	$64.0 million	$63.8 million
Public Utility Tax on Natural Gas	$13.6 million	13.6 million
Public Utility Tax on Water/Sewer	$13.9 million	$14.0 million
Public Utility Tax on Garbage Collection	$10.0 million	$10.0 million
Gasoline Tax	$508 million	$507 million
Public Utility Tax on inter and intra city transportation	$7.7 million	$7.9 million

RESULTS

Excise Taxes by Income Category

Table 5[ix] shows the average excise taxes paid by income group. The income definition is total household income from the SPS. Table 6 shows percent of income paid in tax by income category. The table includes all the state excise taxes listed above and local sales taxes and local taxes on utilities. The percent of income paid in tax declines as income rises. See Appendix 8 for graphs of the total excise tax by income group and total excise tax as a percent of income. These graphs also show the interquartile range (the households between the 25th and 75th percentile. Tax as a percent of income is lower here than found in other estimates.[x] This is explained, in part by the reclassification of some high spending households from the lowest

income categories to higher income categories by removing business losses from the definition of income. In addition, other studies often allocate taxes paid directly by businesses to households.

Table 5

State and Local Excise Tax by Income Category

Average of all Imputation Groups

	Total Excise Taxes	Sales Tax	Alcohol Taxes	Ins Tax	Tobacco Taxes	Utility Taxes	Gas tax
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
1999 HOUSEHOLD TOTAL INCOME							
$0 to $20,000	1,158	785	33	28	135	65	111
$20,000 to $30,000	1,551	1,084	38	43	147	80	159
$30,000 to $40,000	1,901	1,355	56	53	153	84	199
$40,000 to $50,000	2,284	1,647	58	63	182	98	236
$50,000 to $60,000	2,663	1,975	75	68	190	106	249
$60,000 to $70,000	2,947	2,208	75	75	193	114	281
$70,000 to $80,000	3,221	2,454	89	84	188	119	286
$80,000 to $100,000	3,579	2,780	99	89	181	122	308
$100,000 to $130,000	3,998	3,244	93	95	129	134	303
Over $130,000	5,507	4,673	129	102	138	163	302

Table 6

State and Local Excise Tax as Percent of Income

Average of all Imputation Groups

	Total Excise Taxes	Sales Tax	Alcohol Taxes	Ins Tax	Tobacco Taxes	Utility Taxes	Gas Tax
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
1999 HOUSEHOLD TOTAL INCOME							
$0 to $20,000	9.90%	6.72%	0.28%	0.24%	1.15%	0.56%	0.95%
$20,000 to $30,000	6.34%	4.43%	0.15%	0.17%	0.60%	0.33%	0.65%
$30,000 to $40,000	5.57%	3.97%	0.17%	0.15%	0.45%	0.25%	0.58%
$40,000 to $50,000	5.15%	3.71%	0.13%	0.14%	0.41%	0.22%	0.53%
$50,000 to $60,000	4.95%	3.67%	0.14%	0.13%	0.35%	0.20%	0.46%
$60,000 to $70,000	4.60%	3.45%	0.12%	0.12%	0.30%	0.18%	0.44%
$70,000 to $80,000	4.35%	3.31%	0.12%	0.11%	0.25%	0.16%	0.39%
$80,000 to $100,000	4.07%	3.16%	0.11%	0.10%	0.21%	0.14%	0.35%
$100,000 to $130,000	3.57%	2.90%	0.08%	0.09%	0.12%	0.12%	0.27%
Over $130,000	2.75%	2.33%	0.06%	0.05%	0.07%	0.08%	0.15%

Taxes by Total Outlay Categories

The purpose of classifying households and observing their tax burden by the selected classification is to evaluate the fairness of the tax system. The preceding section used current income as the classification method under the assumption that income represents a measure of the ability to pay. An alternative way to classify households is by total household consumption. This can be justified in two ways. First, a household's consumption is a measure of the use the household makes of the economy's resources. Second, consumption can be viewed as a proxy for permanent income under the permanent income hypotheses.[xi] The underlying idea behind the permanent income hypothesis is that consumption is made up of permanent consumption (equal to the household's permanent income where permanent income is defined as an annual income stream with a present value equal to the household's wealth) and transitory consumption. For each household, total consumption may be above or below permanent consumption depending

on whether transitory consumption is positive or negative. When summed across households, it is assumed that transitory consumption is zero.

The definition of total outlays used in this model is a modification of the CEX definition of total expenditures (which includes costs of goods and services, excise and sales taxes, purchases of financed vehicles, home mortgage interest payments, personal insurance, contributions to retirement and pensions, gifts, and contributions). Outlays includes total expenditures with the following modifications: purchase price of financed vehicles is excluded and the principal payment for financed vehicles is included, the principal payment on home mortgages is included, and contributions for retirement and pensions are excluded.[xii] See Appendix 9 for a table showing the relationship between total income and total outlays.

Table 7 shows the state and local excises tax paid by households by total outlay category. As expected the amount of tax rises with outlays.

Table 7

State and Local Excise Tax by Total Outlay Category

Average of all Imputation Groups

	Total Excise Taxes	Sales Tax	Alcohol Taxes	Ins Tax	Tobacco Taxes	Utility Taxes	Gas Tax
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Total Outlays $0 to $15,000	811	512	33	21	109	54	82
$15,000 to $20,000	1,247	831	43	34	133	70	136
$20,000 to $25,000	1,610	1,105	52	46	151	81	176
$25,000 to $30,000	2,056	1,462	63	56	168	92	215
$30,000 to $35,000	2,420	1,752	69	65	187	103	243
$35,000 to $40,000	2,784	2,069	73	71	193	110	267
$40,000 to $45,000	3,077	2,331	81	82	184	120	280
$45,000 to $55,000	3,526	2,757	84	89	170	127	299
$55,000 to $70,000	4,377	3,556	102	97	167	139	317

	Total Excise Taxes	Sales Tax	Alcohol Taxes	Ins Tax	Tobacco Taxes	Utility Taxes	Gas Tax
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Over $70,000	6,553	5,685	108	118	151	166	325

Table 8 shows state and local excise taxes as a percent of total outlays. For alcohol, tobacco, and utility taxes the percent of outlays paid in tax is higher for households with lower total outlays. Tax as a share of total outlays is nearly equal across households for insurance and gas taxes. The share of outlays paid in sales tax is higher for higher spending households. Over all, excise taxes as a percent of total outlays is about the same across households when households are arrayed by spending. See Appendix 10 for graphs of excise taxes by outlay category. These graphs include the interquartile range for each outlay group.

Table 8

State and Local Excise Tax as Percent of Total Outlays

Average of all Imputation Groups

	Total Excise Taxes	Sales Tax	Alcohol Taxes	Ins Tax	Tobacco Taxes	Utility Taxes	Gas Tax
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Total Outlays							
$0 to $15,000	6.91%	4.37%	0.28%	0.18%	0.92%	0.46%	0.70%
$15,000 to $20,000	7.08%	4.72%	0.24%	0.19%	0.75%	0.40%	0.77%
$20,000 to $25,000	7.15%	4.90%	0.23%	0.20%	0.67%	0.36%	0.78%
$25,000 to $30,000	7.48%	5.32%	0.23%	0.20%	0.61%	0.33%	0.78%
$30,000 to $35,000	7.46%	5.40%	0.21%	0.20%	0.58%	0.32%	0.75%
$35,000 to $40,000	7.44%	5.53%	0.20%	0.19%	0.52%	0.29%	0.71%
$40,000 to $45,000	7.25%	5.49%	0.19%	0.19%	0.43%	0.28%	0.66%

	Total Excise Taxes	Sales Tax	Alcohol Taxes	Ins Tax	Tobacco Taxes	Utility Taxes	Gas Tax
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
$45,000 to $55,000	7.13%	5.57%	0.17%	0.18%	0.34%	0.26%	0.61%
$55,000 to $70,000	7.12%	5.78%	0.17%	0.16%	0.27%	0.23%	0.51%
Over $70,000	6.73%	5.84%	0.11%	0.12%	0.15%	0.17%	0.33%

Excise and Property Taxes paid by Households

Estimates of property taxes paid by homeowners and renters are incorporated in the following tables. The homeowner property tax estimates come from the Homeowner Property Tax Model.[xiii] Renters are assume to pay property tax as part of their rents. Residential renter property taxes are estimated by multiplying the monthly rent reported in the SPS by estimates of gross rent multipliers obtained from county assessor offices. In urban areas it was assumed that single family residences were valued at 140 times monthly rent and multi-family residences at 96 times monthly rent. In rural areas it was assumed that single family residences were valued at 120 times monthly rent and multi-family residences at 80 times monthly rent. Average property tax rates by region were used to calculate the property taxes.

Table 9

State and Local Excise and Property Tax as Percent of Income
Average of all Imputation Groups

	Total Excise and Prop Taxes	Total Excise Taxes	Prop Tax
	Sum	Sum	Sum
1999 HOUSEHOLD TOTAL INCOME			
$0 to $20,000	1,838	1,158	680
$20,000 to $30,000	2,402	1,551	851
$30,000 to $40,000	3,218	1,901	1,317
$40,000 to $50,000	3,706	2,284	1,422
$50,000 to $60,000	4,393	2,663	1,730

	Total Excise and Prop Taxes	Total Excise Taxes	Prop Tax
	Sum	Sum	Sum
$60,000 to $70,000	4,937	2,947	1,990
$70,000 to $80,000	5,479	3,221	2,257
$80,000 to $100,000	5,947	3,579	2,368
$100,000 to $130,000	6,770	3,998	2,771
Over $130,000	9,277	5,507	3,771

Table 10

State and Local Excise and Property Tax as Percent of Income

Average of all Imputation Groups

	Total Excise and Prop Taxes	Total Excise Taxes	Prop Tax
	Sum	Sum	Sum
1999 HOUSEHOLD TOTAL INCOME			
$0 to $20,000	15.67%	9.90%	5.77%
$20,000 to $30,000	9.82%	6.34%	3.48%
$30,000 to $40,000	9.43%	5.57%	3.86%
$40,000 to $50,000	8.35%	5.15%	3.21%
$50,000 to $60,000	8.17%	4.95%	3.21%
$60,000 to $70,000	7.71%	4.60%	3.11%
$70,000 to $80,000	7.40%	4.35%	3.05%
$80,000 to $100,000	6.76%	4.07%	2.69%
$100,000 to $130,000	6.04%	3.57%	2.47%
Over $130,000	4.48%	2.75%	1.73%

Using the Microsimulation Model to Calculate the Impact of Alternatives

In this section two types of tax alternatives will be discussed: changes to the tax base and changes in tax rates.

Tax Base Changes

Tax base changes are made by specifying a different set of consumption items to apply to the tax. This is done on the spreadsheet called 'Taxable Items List.xls'. This spreadsheet is a table of 913 consumption items available in the Diary and Interview Surveys. An item is included in the tax base by placing a '1' in the appropriate column and is excluded by placing a '0'; The column labeled 'Current' is reserved for the current sales tax base. Two columns are provided for alternative tax base choices. The column labeled 'Other' contains the codes for the miscellaneous excise taxes. 'Baseadj' is used to calibrate the model. (see the section above on Calibrating the Model).

The SAS program called 'Create Combined Consumption Tax Base' (see Appendix 13) reads in the CEX data and the selections in 'Taxable Items List.xls'. The program uses this information to create the current and alternative tax bases. The program uses the matches between the CEX and the SPS households to create a record for each SPS household with information on the tax bases for the current sales tax, alternative sales taxes, and the miscellaneous taxes.

Short outline of the 'Create Combined Consumption Tax Base' program

1. Read Diary and Interview Data files (These data sets are quarterly so 8 data sets are read in.)
2. Combine the data sets from step 1 into one data set. (A permanent data set is created so that step 1 can be skipped once it has been created the first time.)
3. Read in the Taxable Items List.
4. Merge consumption and taxable items and calculate tax bases for excise taxes.
5. Separate data into quarterly tax base data sets by Diary and Interview. This generates (2 data sets by 4 quarters by 7 imputation groups) 56 data sets. The observations in each data set are summed by CEX household identification number.
6. Bring in the files that match CEX households with SPS households and assign the appropriate SPS households to each observation in the tax base data sets.
7. Combine the Diary data sets and annualize the weekly expenditures.
8. Combine the Interview data sets.
9. Combine the Diary and Interview data sets and sum by SPS household. This creates one data set for each of the seven imputation groups. Permanent data sets are created so that tax rate changes can be run without recreating the tax bases.

Tax Rate Changes

The tax amounts are generated by the program called 'Tax Calculator for Microsimulation Model'. (See appendix 13) The program calculates the tax from the current tax rates and alternative tax rates. Tables are generated showing the total tax amounts and the distribution of taxes across income categories. The program brings in the tax bases created by 'Create Combined Consumption Tax Base'. The program calculates the tax for each of the seven imputation groups and averages the results.

Tax Calculator for SimTax Model

The Excise Tax Microsimulation Model was used to generate output for use in the SimTax[xiv] Model. The SimTax model was developed at the request of the Washington Tax Structure Study Committee, and was used by committee members in developing their tax alternative proposals. SimTax is a Microsoft Excel spreadsheet that allows the user to change elements of the Washington State tax system and see the impact on revenue and the distribution of tax burdens on households. The household tax distribution contained in SimTax for alternatives related to sales tax, property tax, individual income tax , value added tax, and goods and services tax was derived using the Excise Tax Microsimulation Model.

Appendix 14 contains the program called 'Tax Calculator for SimTax Model'. It is structured similar to 'Tax Calculator for Microsimulation Model'. Additional programming steps have been added to simulate aspects of a personal income tax. One personal income tax considered by the Washington Tax Structure Study Committee included a standard deduction of $5,000 for single returns and for married households $7,000 plus the smaller of $3,000 or the earnings of the second wage earner. The program called 'Second Earner Wages for Married Households' (also in Appendix 14) establishes the amount of the second earner wages from the SPS data. The simulation shown here illustrates the impact of a graduated income tax using this standard deduction (no itemizing allowed) and rates of 2% on first $49,900 of income, 3% on income between $49,900 and $120,650, and 5% on income above $120,650. (Single return brackets are half these amounts.)

The Committee also considered a goods and services tax. The goods and services tax is a sales tax which covers all goods and services. The impact of this tax was simulated by including in the alternative tax base all the goods and services available in the 'Taxable Items List.xls'.

The results of the simulation are shown in Table 11.

Table 11

Average of all Imputation Groups

	State and Local Sales Tax	Goods and Services Tax (1% rate)	Grad Rate Inc Tax (2%, 3%, 5% rates)
	Sum	Sum	Sum
1999 HOUSEHOLD TOTAL INCOME			
$0 to $20,000	785	169	46
$20,000 to $30,000	1,084	226	231
$30,000 to $40,000	1,355	272	412
$40,000 to $50,000	1,641	327	610

	State and Local Sales Tax	Goods and Services Tax (1% rate)	Grad Rate Inc Tax (2%, 3%, 5% rates)
	Sum	Sum	Sum
$50,000 to $60,000	1,975	371	814
$60,000 to $70,000	2,208	419	1,018
$70,000 to $80,000	2,454	460	1,281
$80,000 to $100,000	2,780	515	1,709
$100,000 to $130,000	3,244	589	2,552
Over $130,000	4,593	839	7,379

[i] See the Office of Financial Management's web site for detailed information on the SPS: http://www.ofm.wa.gov/sps/2000/index.htm. The data set used in this model is the Oct 1, 2001 release (sps00_04).

[ii] BLS Handbook of Methods, 1997, Chapter 16. Consumer Expenditures and Income

[iii] Statistical matching is a common technique for the construction of microsimulation models. See Cohen for a survey of statistical matching in micosimulation models. Statistical matching is also used in the fields of media research and data mining where it is often called data fusion. Cohen M, L (1991), 'Statistical Matching and Microsimulation Models', in C F Citro and E A Hanushek (eds), Improving Information for Social Policy Decisions. The Uses of Microsimulation Modeling vol. II National Academy Press, Washington D.C.

[iv] See Rubin, D.B. (1987). Multiple Imputation for Nonresponse in Surveys. New York:Wiley. and Little, R.J.A and Rubin, D.B. (1987). Statistical Analysis with Missing Data. New York: Wiley.

[v] Since the CEX is a sample, each observation has a weight associated with it. The likelihood of selection of a particular candidate was proportional to the relative weight of that candidate within the selected group. See Appendix 2 for the SAS programs that select the matches.

[vi] The income definition used for the CEX data is the before tax income (from the CEX) adjusted by removing negative values for business and rental income and the value of food stamps. The income definition used for the SPS column is SPS defined total household income.

[vii] Also, some hotel/motel and car rentals on out-of-town trips are assumed to take place outside the state and so are exempt from Washington's tax. The expenditure amount reported for vehicles is the amount spent net of any trade-in. Under Washington's sales tax the trade-in value of vehicles is offset against the price of new and used vehicles. So, the net outlay number is used directly and the value of the trade-in is not included in the sales tax base.

[viii] As part of their postsurvey evaluations, the Bureau of Labor Statistics compares the expenditures reported in the survey with other independent sources of household expenditures. The most recent comparison was published in 1994. See Branch, E. Raphael, 'The Consumer Expenditure Survey: a comparative analysis', Monthly Labor Review Dec 1994.

[ix] Table 4 is intentionally left out.

[x] See Citizen's for Tax Justice and Institute on Taxation and Economic Policy, Who Pays? A Distributional Analysis of the Tax Systems in All 50 States, http://www.ctj.org/htm/whopay.htm

[xi] See Friedman, M. (1957) A Theory of the Consumption Function. Princeton, Princetion University Press, and the extensive literature that followed.

[xii] See Rogers, John M, and Maureen B. Gray, "CE data: quintiles of income versus quintiles of outlays", Monthly Labor Review, Dec 1994. They, however, include pension and retirement contributions in their definition of total outlays.

[xiii] For documentation see: Homeowner Property Tax Model 2002, Rick Peterson, Office of Program Research, Washington House of Representatives, October 22, 2001.

[xiv] SimTax is available on the Washington Dept of Revenue web site see: http://dor.wa.gov/content/WAtaxstudy/Tax_Design.htm